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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/531,553	05/02/2006	Vitali Nesterenko	0321.68367	3552
24978 7590 05/03/2010 GREER, BURNS & CRAIN 300 S WACKER DR 25TH FLOOR CHICAGO, IL 60606				
EXAMINER STARK, JARRETT J				
ART UNIT 2823		PAPER NUMBER		
MAIL DATE 05/03/2010		DELIVERY MODE PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/531,553

Applicant(s)

NESTERENKO ET AL.

Examiner

JARRETT J. STARK

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 April 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/CD)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 4/15/2010 have been fully considered but they are not persuasive regarding claims 1-20

In response to applicant's arguments against the assertion that HIP is a functional equivalent to uniaxial pressing, the intended use of both HIP and uniaxial pressing is to apply heat and pressure in order to bond substrates. The asserted functional equivalence is that both are means of providing heat and pressure to bond substrates. Both produce the claimed result, thus are capable of being considered functional equivalents. Furthermore this assertion is supported by the secondary reference Cohn et al. The relevant cited portion of Cohn explicitly states that HIP is a functional alternative selected merely to apply bonding pressure.

With regards to the Affidavit filed 12/17/2009, the Affidavit was considered at the time of the previous office action mailed 1/19/2010. The previously provided response address the argument presented in both the Affidavit and the Remarks filed. Specifically the Affidavit and Remarks are directed to limitations which are still not found in the presented and currently pending claim language.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1- 14 and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhat et al. (US 5,207,864) in view of Cohn et al. (US 7,276,789 B1).

Regarding claim 1, 11, 12, 14, 19, Bhat et al. discloses a method for semiconductor wafer bonding, the method comprising steps of:

- providing semiconductor wafers to be bonded (Bhat, Abstract);
- cleaning the surfaces of wafers to remove particle and chemical contaminants and provide bonding surfaces comprised of the entire surface of the wafers (Bhat, Abstract);
- bringing the bonding surfaces of the wafers into direct contact with each other to weakly bond the wafers to each other (Bhat, Abstract (i.e. "van der Waals force");
- placing the wafers in a pressurization chamber (Bhat, Abstract);
- applying bonding pressure to the wafers (Bhat, Col. 6 lines 3-11);
- heating the wafers during said step of applying bonding pressure (Bhat, Abstract); and

controlling and maintaining said steps of heating and applying bonding pressure for a period of time to substantially strengthen bonding between the wafers (Bhat, Col. 6 lines 3-11);

Bhat et al. does not specify that the pressure is applied solely through isostatic pressure. It was however known to those of ordinary skill in the art to solely apply an isostatic type of pressure when bonding wafers. At the time of the invention it was conventional use hot press bonding as well as Hot Isostatic Press or Hot Isostatic Processing (HIP) diffusion bonding. HIP is known conventional means of applying evenly controlled pressure. It would be obvious to one of ordinary skill in the art to select isostatic means for applying pressure when bonding wafers. For an examples of one of ordinary skill in the art applying isostatic pressure when performing a diffusion bonding process see Cohn et al. (entire document).

"Still another alternative for supplying the necessary pressure and heat is to place a substrate pair into a high-temperature bag (made of a material such as polyimide or metal foil) and subject it to hot -isostatic-pressing."

It would have been within the scope of one of ordinary skill in the art at the time of the invention to combine the teachings of Bhat and Cohn to enable the pressure step of Bhat to be performed according to the teachings of Cohn because one of ordinary skill would have been motivated to look to alternative suitable methods of performing the disclosed pressure step of Bhat and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP § 2144.07.

When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. KSR Int'l Co v. Teleflex Inc.

Regarding claim 2, Bhat in view of Cohn disclose the method of claim 1, further comprising steps of: cooling the wafers; and removing the wafers from the pressurization chamber (Bhat, Col. 6 line 10).

Regarding claim 3, Bhat in view of Cohn disclose the method of claim 2, wherein said step of cooling is conducted while said step of controlling and maintaining continues said step of applying bonding pressure, followed by a step of depressurization (Bhat, Abstract).

Regarding claim 4, Bhat in view of Cohn disclose the method of claim 1, wherein said step of controlling and maintaining comprises: creating a temperature ramp and a pressure ramp to substantially strengthen bonding between the wafers (Bhat, Entire document—the process disclosed by Bhat is to improve bonding which implicitly mean to strengthen bonding);

Regarding claim 5, Bhat_in view of Cohn disclose the method of claim 4, wherein said step of controlling and maintaining creates the temperature ramp as a function that is independent from the pressure ramp (Bhat, Abstract).

Regarding claim 6, Bhat_in view of Cohn disclose the method of claim 1, wherein said step of heating commences prior to said step of applying pressure (Bhat, Abstract).

Regarding claim 7, Bhat_in view of Cohn disclose the method of claim 1, wherein said step of heating commences with or after said step of applying pressure (Bhat, Abstract).

Regarding claim 8, Bhat_in view of Benavides and/or Curbishley disclose the method of claim 1, wherein said step of cleaning creates hydrogen terminated surfaces at the semiconductor surfaces to be bonded (Inherent result of HF dip).

Regarding claim 9, Bhat_in view of Cohn disclose the method of claim 1, wherein said step of bringing creates one of a Van der Waals and Hydrogen bond (Bhat, Abstract).

Regarding claims 10 and 13, Bhat in view of Cohn disclose the method of claim 9, wherein said step of bringing brings the semiconductor surfaces to be bonded

into direct contact with each other with or without an intervening layer (direct and indirect bonding are known in that art. The selection of the two types of bonding, indirect or direct bonding, is a matter of design choice which is dependent upon the materials which are being bonded. One of ordinary skill in the art would be able to select one of the two known process on the base of its suitability

Regarding claim 17, Bhat in view of Cohn disclose the method of claim 1, wherein said steps of providing, cleaning and bringing are repeated to form a plurality of weakly bonded pairs of wafers and said steps of applying, heating, and controlling and maintaining are carried out with the plurality of weakly bonded pairs of wafers simultaneously in the pressurization chamber (Bhat, Abstract).

Regarding claim 18, Bhat in view of Cohn disclose the method of claim 1, further comprising, prior to said step of placing, loading said wafers in an unsealed container, and wherein said step of placing is carried out by placing said unsealed container in said pressurization chamber (Bhat, Abstract).

Regarding claim 20, Bhat in view of Cohn disclose the method of claim 19, further comprising a step of controlling said heating and pressing to induce strain in at least one of said wafers (inherent result of heat/pressure bonding process).

Claims 15, 16, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhat et al. in view of Cohn et al. in view of in further view of Baker et al. (US 6,189,766 B1).

Regarding claims 15 and 16, Bhat in view of Cohn disclose the method of claim 1, however are silent upon further teaching that Argon can be used as a pressure medium within a HIP chamber. At the time of the invention Argon gas was a known pressure medium selected for use in a HIP. As disclosed by the prior art reference Baker et al. Conventional HIP bonding apparatus which use Argon as the pressure medium allow for "stress free" bonding and is an ideal choice when using isostatic pressure to bond semiconductor substrates. (Baker et al. Col. 6, lines 9-52).

Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to select isostatic means to apply pressure since it was known at the time to be a function equivalent means to apply pressure, and further select a conventional commercial Hot Isostatic Pressure bonding apparatus which uses Argon as pressure medium since it was known to provide the benefit of "stress free" thermal bonding of semiconductor substrates.

Regarding claims 21 and 22, Bhat in view of Cohn in view of Baker et al. disclose the method of claims 1 and 19, wherein using the known apparatus of Baker et al. to apply the HIP, will allow for the step of heating and pressing applies solely

isostatic pressure to the bonded wafers, and applies pressure to the bonded wafers without encapsulating the wafers.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **JARRETT J. STARK** whose telephone number is (571)272-6005. The examiner can normally be reached on Monday - Thursday 7:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jarrett J Stark/
Primary Examiner, Art Unit 2823

4/30/2010
/J. J. S./
Primary Examiner, Art Unit 2823